

traverse this object and submit that the drawings do comply with 37 CFR §1.83(a). For example, the “first multiplexing unit” of claim 1 is shown in FIG. 4 as features 403, 404, 405, 406 and 407. Additionally, the “plurality of optical line amplifiers” of claim 1 is shown in FIG. 2 as features 210, 220, 230 and 240. Furthermore, the “first coarse wavelength division multiplexing unit” of claim 7 is shown as feature 403 in FIG. 4 and the “first, second, third, and fourth fine wavelength division multiplexing units” of claim 7 are shown in FIG. 4 as features 404, 405, 406 and 407. Applicants note that 37 CFR §1.83(a) merely requires that the drawings “show every feature of the invention specified in the claims” and does not require that the *entirety* of a claimed invention be shown in a single figure.

Furthermore, Applicants respectfully submit that the requirements of 37 CFR §1.83(a) should be read in light of the statutory requirement of 35 U.S.C. §113 and 35 U.S.C. §112. 35 U.S.C. §113 requires the Applicant to furnish drawings only where *necessary* for the understanding of the subject matter to be patented. Additionally, 35 U.S.C. §112 requires that the specification and drawings of a patent application contain only that amount of disclosure necessary to teach one skilled in the art how to make the claimed invention without undue experimentation. Applicants submit that the combination of what is shown in FIGS. 2 and 4, combined with the written description on page 14, lines 3-12, sufficiently describes the inventions recited in claims 1 and 7 as to teach one skilled in the art how to make the claimed systems for amplifying optical signals. Applicants further submit that any further drawings are not necessary for an understanding of the subject matter to be patented. For at least the foregoing reasons, Applicants respectfully request the withdrawal of the objection to the drawings under 37 CFR §1.83(a).

Claims 7 and 12 have been rejected under the "written description" requirement of 35 U.S.C. §112, first paragraph. To satisfy the written description requirement of 35 U.S.C. §112, first paragraph, Applicants must convey with reasonable clarity to those skilled in the art that, as of the filing date, they were in possession of the claimed invention. See M.P.E.P. § 2163.02. Applicants respectfully submit that the written description on page 14, lines 3-12, combined with what is shown in FIGS. 2 and 4, does convey with reasonable clarity to those skilled in the art that Applicants were in possession of the inventions recited in claims 7 and 12.

In support of this rejection, the Office Action asserts that the specification "does not clearly show and describe how a first, second, third, and a fourth fine wavelength division multiplexing unit are optically coupled in parallel between a first coarse wavelength division multiplexing unit and a plurality of optical line amplifiers." FIG. 2 illustrates optical line amplifiers 210, 220, 230 and 240 connected to a coarse wavelength division multiplexing unit 262. FIG. 4 additionally illustrates fine wavelength division multiplexing units 404, 405, 406 and 407 connected to a coarse wavelength division multiplexing unit 403. Furthermore, the specification on page 14, lines 7-10 clearly describes that "[f]ine WDM units 405-407 are each optically coupled in parallel between CWDM unit 403 and respective optical amplifiers 210-240 (not shown in FIG. 4)." Applicants, thus, respectfully submit that one skilled in the art, from the illustrations in FIGS. 2 and 4, and from the description in the specification, would understand how to optically couple the fine WDM units 405-407 in parallel between CWDM unit 403 and optical amplifiers 210-240. The specification and drawings, therefore, do reasonably convey to those skilled in the art that Applicants were in possession of the

invention recited in claims 7 and 12 at the time the application was filed. Withdrawal of the rejection under 35 U.S.C. §112, first paragraph, is, therefore, respectfully requested.

Claim 29 has been rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by TAKADA (U.S. Patent No. 5,949,563). Applicants respectfully traverse the rejection and submit that TAKADA does not anticipate the claimed invention.

TAKADA discloses a wavelength division multiplexing transceiver that transmits and receives a plurality of light waves having different wavelengths over a single optical transmission line. The system of TAKADA includes multiplexer and demultiplexer units (11M, 11D, 12M, 12D; FIG. 2), optical transmission units (21S, 21R, 22S, 22R; FIG. 2), optical filters (21F, 22F; FIG. 2), and optical couplers (31, 32; FIG. 2).

On the transmit side of the system of TAKADA, as described in column 6, lines 15-36 (the functional description of the components in FIG. 1 applies to similarly labeled components in FIG. 2), the multiplexer units (11M, 12M) multiplex input electrical signals and supply the electrical signals to the optical transmission units (21S, 22S). The optical transmission units convert the electrical signals into light waves with wavelengths (λ_1 and λ_2). The Optical coupler (31) receives the light waves from the optical transmission units and combines the light waves for transmission over an optical fiber (OPTICAL OUTPUT; FIG. 2). On the receive side of the system of TAKADA, the optical coupler 32 receives the optical input signal and bifurcates the signal. The optical filters (21F, 22F) receive the bifurcated signal and extract light waves of the appropriate wavelength (λ_1 or λ_2). Optical reception units 21R and 22R receive the light waves of wavelengths λ_1 and λ_2 , respectively, and electro-optically convert the light waves into electrical signals. Demultiplexers 11D and 12D demultiplex the electrical signal derived from the converted light waves.

As discussed above, TAKADA discloses the multiplexing of *electrical signals* for electro-optical conversion by optical transmission units. TAKADA does not disclose or even suggest a fine wavelength division multiplexing/demultiplexing unit that “multiplexes the *optical signals* within a respective subgroup of optical signals into individual channels” (emphasis added) as recited in claim 29. The multiplexer 11M cited in the Office Action as corresponding to the claimed fine wavelength division multiplexer merely multiplexes electrical signals and does not multiplex optical signals as claimed. Applicants, therefore, respectfully submit that TAKADA does not anticipate the invention recited in claim 29. Withdrawal of this rejection is, therefore, respectfully requested.

Claims 29-30, 32, 34-36, 38 and 40 have been rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by OTSUKA et al (U.S. Patent No. 5,841,557). Applicants respectfully traverse.

OTSUKA et al. discloses a system and method for scrambling the polarization of optical signals that have been combined, using wavelength division multiplexing, into combined optical signals. In a representative embodiment shown in FIG. 15, and described in column 19, line 30 through column 20, line 2, optical signals are transmitted via “signal light transmission sections” (e.g., 12N-1, 12W-(2i-1)) that are associated with optical channels (e.g., ch. 1(W), ch. 2i-1(W), etc.). Optical signals transmitted via the signal light transmission sections are combined in first “wave combiners” (e.g., 13-1, 13-2, 13-3, 13-4). The signals from the first wave combiners are further combined in second “wave combiners” (e.g., 13-5, 13-6) and in a third “wave combiner” 13-7. The combined optical signal output from “wave combiner” 13-7 is input into a polarization scrambler 14W-1 before amplification by an amplifier 18W. Alternatively, in the event of the failure of amplifier

18W, the combined optical signal output from "wave combiner" 3-7 can be amplified by backup amplifier 18P (see column 19, lines 41-54).

The Office Action alleges that the wave combiner 13-5 of OTSUKA et al. "multiplexes the optical signals within a respective subgroup of optical signals into individual channels...within a corresponding subwindow" as recited in claim 29. Applicants respectfully submit that OTSUKA et al. merely teaches the multiplexing of individual optical channels (ch.1 (W), ch.1 (P), ch. 2i-1(W); FIG. 15) into subgroups of optical signals using wave combiners 13-5, 13-6 and 13-7. OTSUKA et al. contains no teaching or suggestion of the operation of the wave combiners as the Office Action has alleged. Applicants, therefore, respectfully submit that OTSUKA et al. does not suggest or disclose, among other features, each fine wavelength division multiplexing/demultiplexing unit multiplexing "the optical signals within a respective subgroup of optical signals into individual channels within a corresponding window" as recited in claim 29. Withdrawal of the rejection of claim 29 is, therefore, respectfully requested.

Claims 30 and 32 variously depend from claim 29. Claims 30 and 32, therefore, patentably distinguish over OTSUKA et al. for at least the reasons set forth with respect to claim 29 above.

Claim 34 depends from claim 29. Claim 34, therefore, patentably distinguishes over OTSUKA et al. for at least the reasons set forth with respect to claim 29 above. Furthermore, claim 34 recites additional features not suggested or disclosed by OTSUKA et al. The Office Action alleges that OTSUKA et al. discloses a fine WDM unit that comprises "first (13-1, FIG. 24), second (13-2, FIG. 24), third (13-3, FIG. 24), and fourth (13-M, FIG. 24) fine WDM units." Applicants respectfully submit, however, that the Office Action does not

address the features of the claim. Claim 34 recites, among other things, "said first, second, third, and fourth fine wavelength division multiplexing units further multiplexing said first, second, third and fourth subgroups of optical signals by wavelength into channels for carrying optical signals having different wavelengths...." Applicants respectfully submit that OTSUKA et al. merely teaches the multiplexing of individual optical channels (ch.1 (W), ch.1 (P), ch. 2i-1(W); FIG. 15) into subgroups of optical signals using wave combiners 13-5, 13-6 and 13-7. OTSUKA et al. contains no teaching or suggestion of "multiplexing said first, second, third and fourth subgroups of optical signals by wavelength into channels" as recited in claim 34. Applicants, therefore, respectfully submit that OTSUKA et al. does not anticipate the invention of claim 34. Withdrawal of the rejection of claim 34 is, therefore, respectfully requested.

Claim 35 recites features similar to those discussed above with respect to claim 29. Claim 35, therefore, patentably distinguishes over OTSUKA et al. for similar reasons to those set forth with respect to claim 29 above.

Claims 36 and 38 depend from claim 35. Claims 36 and 38, therefore, patentably distinguish over OTSUKA et al. for at least the reasons to those set forth with respect to claim 35 above.

Claim 40 recites similar features to those discussed above with respect to claim 34. Claim 40, therefore, patentably distinguishes over OTSUKA et al. for similar reasons to those set forth with respect to claim 34 above.

Claims 1, 7-10, 14, 16, 20 and 27 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over OTSUKA et al. in view of CHRAPLYVY et al. (U.S. Patent No. 5,907,420). Applicants respectfully traverse.

As discussed above, OTSUKA et al. merely discloses the amplification of a combined optical signal output from “wave combiners” (e.g., 13-7; FIG. 15) by a single amplifier (e.g., 18; FIG. 15). As admitted by the Office Action, OTSUKA et al. contains no suggestion or teaching of “a plurality of optical line amplifiers, each amplifier configured to amplify a subgroup of optical signals associated with a different subwindow of said plurality of subwindows within the operating window” as recited in claim 1. The Office Action alleges that CHRAPLYVY et al. discloses these features. Applicants submit, however, that CHRAPLYVY et al. merely discloses the use of several erbium doped fiber amplifiers (EDFA #1-#8; FIG. 2), connected in series, to amplify an entire operating window comprising wavelengths λ_1 , λ_2 , λ_3 , λ_4 , λ_5 , λ_6 , λ_7 , and λ_8 supplied by tunable lasers (See FIG. 2 and column 4, lines 7-15). CHRAPLYVY contains no teaching, or even a suggestion, of the use of a plurality of optical line amplifiers to amplify a subgroup of optical signals associated with a different subwindow of a plurality of subwindows, as recited in claim 1. Therefore, since OTSUKA et al. or CHRAPLYVY, either singly or in combination, do not disclose the combination of features recited in claim 1, Applicants respectfully submit that the Office Action has failed to make out a *prima facie* case of obviousness and, further, that the Office Action's rationale to combine the alleged teachings of OTSUKA et al. and CHRAPLYVY et al. is based upon impermissible hindsight. Withdrawal of the rejection of claim 1 is, therefore, respectfully requested.

Claims 7-10 depend from claim 1 and, therefore, patentably distinguish over OTSUKA et al. and CHRAPLYVY et al., whether taken alone or in any reasonable combination, for at least the reasons set forth with respect to claim 1 above. Furthermore, Applicants submit that these claims recite other features not disclosed or suggested by the

applied references. For example, claim 7 recites “first, second, third, and fourth fine wavelength division multiplexing units optically coupled in parallel between said first coarse wavelength division multiplexing unit and said plurality of optical line amplifiers.” The Office Action has failed to address the above-recited features. Applicants respectfully submit that OTSUKA et al. or CHRAPLYVY et al., either singly or in combination, do not suggest or disclose these features.

Claims 14 recites features similar to those discussed above with respect to claim 1. Claim 14, therefore, patentably distinguishes over OTSUKA et al. and CHRAPLYVY et al. for similar reasons to those set forth with respect to claim 1.

Claims 16 and 20 depend from claim 14 and, therefore, patentably distinguishes over OTSUKA et al. and CHRAPLYVY et al. for at least the reasons set forth above with respect to claim 14.

Claim 27 recites “optical line amplifier” features similar to those discussed above with respect to claim 1. Claim 27, therefore, patentably distinguishes over OTSUKA et al. and CHRAPLYVY et al. for similar reasons to those set forth with respect to claim 1.

Claims 31-33 and 37-39 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over OTSUKA et al. in view of MELI et al. (U.S. Patent No. 5,946,117). The Office Action cites MELI et al. for allegedly disclosing various features of claims 31-33 and 37-39 which depend, respectively, from claims 29 and 35. Applicants respectfully submit, however, that MELI et al. does not remedy the deficiencies of OTSUKA et al. discussed above with respect to claims 29 and 35. Applicants, therefore, respectfully request withdrawal of the rejections of claims 31-33 and 37-39 for at least the reasons set forth above with respect to claims 29 and 35.

Claims 2-6, 15 and 17-19 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over OTSUKA et al. in view of CHRAPLYVY et al. and MELI et al. The Office Action cites MELI et al. for allegedly disclosing various features of claims 2-6, 15 and 17-19, which depend, respectively, from claims 1 and 14. Applicants respectfully submit, however, that MELI et al. does not remedy the deficiencies of OTSUKA et al. and CHRAPLYVY et al. discussed above with respect to claims 1 and 14. Applicants, therefore, respectfully request withdrawal of the rejections of claims 2-6, 15 and 17-19 for at least the reasons set forth above with respect to claims 1 and 14.

Claims 11-12 and 21-25 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over OTSUKA et al. in view of CHRAPLYVY et al. and BAKER (U.S. Patent No. 5,452,124). The Office Action cites BAKER as allegedly disclosing various features of claims 11-12 and 21-25, which depend, respectively, from claims 1 and 14. Applicants respectfully submit, however, that BAKER does not remedy the deficiencies of OTSUKA et al. and CHRAPLYVY et al. discussed above with respect to claims 1 and 14. Applicants, therefore, respectfully request withdrawal of the rejections of claims 11-12 and 21-25 for at least the reasons set forth above with respect to claims 1 and 14.

Claims 13, 26 and 28 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over OTSUKA et al. in view of CHRAPLYVY et al. and ONAKA et al. (U.S. Patent No. 5,886,804). The Office Action cites ONAKA et al. as allegedly disclosing various features of claims 13, 26 and 28, which depend, respectively, from claims 1, 14 and 27. Applicants respectfully submit, however, that ONAKA et al. does not remedy the deficiencies of OTSUKA et al. CHRAPLYVY et al. discussed above with respect to claims 1, 14 and 27. Applicants, therefore, respectfully request withdrawal of the rejections of

claims 13, 26 and 28 for at least the reasons set forth above with respect to claims 1, 14 and 27.

In view of the foregoing amendments and remarks, Applicants respectfully request the Examiner's reconsideration of this application, and the timely allowance of the pending claims. To the extent necessary, a petition for an extension of time under 37 CFR 1.136 is hereby made. Please change any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1070 and please credit any excess fees to such deposit account.

Respectfully submitted,

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MARKED-UP VERSION OF AMENDMENT SHOWING CHANGES MADE

Please amend claim 12 as follows:

12. (Twice Amended) The system of claim [11] 1, wherein said plurality of optical line [amplifier comprises] amplifiers comprise first to fourth line amplifiers, said plurality of subgroups of optical signals [comprises] comprise first to fourth subgroups of optical signals in corresponding first to fourth subwindows within the operating window, and further comprising:

a second multiplexing unit configured to multiplex the optical signals in the set of multiple channels into said first to fourth subgroups of optical signals in corresponding first to fourth subwindows within the operating window, each subwindow corresponding to a different group of channels within the operating window; and

first to fourth optical fibers arranged in parallel between said first and second multiplexing units, said first to fourth optical line amplifiers optically coupled along said first to fourth optical fibers, respectively, and configured to amplify said first to fourth subgroups of optical signals corresponding to said first to fourth subwindows within the operating window;

wherein said first and second multiplexing units are arranged at first and second sites, and said first and third optical line amplifiers and said first and third optical fibers each configured to pass optical signals traveling in a first direction between said first and second sites, and said second and fourth optical fibers each configured to pass optical signals traveling in a second direction between said first and second sites opposite to said first direction.